

D. Pre-Operational Testing and Logging Plan

1.0 FACILITY INFORMATION

Facility Information

Facility name:

[REDACTED]

[REDACTED]

Facility contact:

Ronald T. Evans, tevans@capturepointllc.com
1101 Central Expy S, Suite 150, Allen TX 75013
832-300-8225

Well location:

[REDACTED]

[REDACTED]

1.1 INTRODCUTION

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2.0 INJECTION WELLS – TESTING STRATEGY

[REDACTED]

[REDACTED]

2.1 DEVIATION CHECKS

[REDACTED]

2.2 LOGGING PROGRAM

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2.2.1 Surface String Logging Program

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Table 1. Well Log Details

Open Hole - 17 1/2"		
Well Log	Measurement	Data Acquisition Profile
Spontaneous Potential	Electrical Potential	Permeability and formation fluid salinity
Resistivity	Ohm-meters	Porosity, water saturation and the presence of hydrocarbons
Gamma Ray	API Units	Lithology
Open Hole Caliper	Inches	Borehole diameter and log correction. Account for washouts
Cased Hole – 9 5/8"		
Well Log	Measurement	Data Acquisition Profile
Cement Bond	Acoustic	Determine the integrity of the cement
Variable Density	Sonic	Well completion quality
Temperature	Degrees Fahrenheit	Develop temperature profile Establish Baseline

Note: Additional diagnostic logs may be run at the discretion of CapturePoint Solutions, LLC geological consultant or as directed by the authorized regulatory UIC Director.

2.2.2 Long String Logging Program



Table 2. Well Log Details

Open Hole – 12 1/4"		
Well Log	Measurement	Data Acquisition Profile
Spontaneous Potential	Electrical Potential	Permeability and formation fluid salinity
Resistivity	Ohm-meters	Porosity, water saturation and the presence of hydrocarbons
Gamma Ray	API Units	Lithology
Open Hole Caliper	Inches	Borehole diameter and log correction. Account for washouts
Density/Neutron	Porosity (Phi)	Matrix Porosity
Fracture Finder	Image Log	Formation Imaging for breakouts and fractures
Dipole Sonic	Sonic Compressional and Shear	Porosity, Mechanical Properties
Cased Hole – 9 5/8"		
Well Log	Measurement	Data Acquisition Profile
Cement Bond	Acoustic	Determine the integrity of the cement
Variable Density	Sonic	Well completion quality
Temperature	Degrees Fahrenheit	Develop temperature profile Establish Baseline

Note: Additional diagnostic logs may be run at the discretion of CapturePoint Solutions, LLC geological consultant or as directed by the authorized regulatory UIC Director.

2.2.3 Analysis and Reporting

[REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
[REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
[REDACTED]
[REDACTED]
- [REDACTED]

Reports will be submitted to the authorized regulatory UIC Director.

2.3 CORE PROGRAM

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Table 3. Coring Details

[REDACTED]	
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[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

2.3.1 Analysis

[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Parameter	Measurement	Units
Porosity	Total Porosity Diffuse Porosity	Percent
Permeability	Vertical Permeability Horizontal Permeability	mD
Relative Permeability	Relative Gas Permeability Relative Aqueous Permeability	mD
Saturation	Fluid Saturation Residual Aqueous Saturation Residual Gas Saturation	Percent
Resistivity		Ohm-meters
Compressibility	Bulk Compressibility Pore Compressibility	1/Pa
Physical Properties	Rock Strength Ductility Elastic Properties	UCS % Pa
Lithology	Description	
Rock/Soil Type	Petrology Mineralogy	SEM Thin sections
Capillary Pressure		P _c

2.3.2 Reporting

[REDACTED]

2.4 FORMATION PRESSURE AND FLUID SAMPLING

[REDACTED]

[REDACTED]

[REDACTED]

2.4.1 Analysis

[REDACTED]

Table 5. Physical and Chemical Testing Parameters

Parameter	Methodology
Reservoir Pressure	Downhole gauges
Fluid Temperature	Thermocouple
pH	pH electrode
Conductivity	APHA 2510
Fracture Pressure	Step-rate test and core analysis
Static Fluid Level	Fluid level ultrasonic transmitter

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2.4.2 Reporting

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

[REDACTED]

2.5 FRACTURE PRESSURE

[REDACTED]

[REDACTED]

2.6 DEMONSTRATION OF INJECTION WELL MECHANICAL INTEGRITY

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Table 6. Mechanical Integrity Testing

Class VI Rule Citation	Rule Description	Test Description	Program Period
40 CFR 146.89(a)(1)	MIT – Internal	Pressure test using liquid or gas to determine that there is no significant leak in the casing, tubing or packer	After construction
40 CFR 146.87(a)(4)	MIT – External	Pressure test using liquid or gas and a casing inspection log to demonstrate the internal and external mechanical integrity of the well	
40 CFR 146.87(a)(4)	MIT – External		
40 CFR 146.87(e)(1)	Testing prior to operating	Pressure fall-off test, pump test and injectivity test to verify the hydrogeologic characteristics of the injection zone	Prior to operation

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Table 7. Wireline Logs and Description

Test	Description
Casing Inspection Log (Internal MIT)	To detect deformation, physical wear and or corrosion
Cement Bond Log (External MIT)	To evaluate integrity of cement job between the casing and the formation
Tracer Survey (Oxygen Activation Log)	To detect the movement of fluid behind pipe
Temperature or Noise Log (External MIT)	To detect thermal anomalies that deviate from the baseline gradient

[REDACTED]

[REDACTED]

1. [REDACTED]

2. [REDACTED]

[REDACTED]

[REDACTED]

2.7 FORMATION TESTING

[REDACTED]

[REDACTED]

2.7.1 Ambient Pressure Fall-off Testing

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2.7.2 Step-Rate Test

[REDACTED]

[REDACTED]

- _____
- _____

3.0 MONITORING WELL – TESTING STRATEGY

[REDACTED]

[REDACTED]

[REDACTED]

3.1 DEVIATION CHECKS

[REDACTED]

3.2 LOGGING PROGRAM

[REDACTED]

Table 8. Scheduled Logging Suites

<u>Logging Run</u>	<u>Logging tools</u>	<u>Data Acquisition</u>
Triple Combo	Gamma Ray (GR), Caliper, Spontaneous Potential (SP), Resistivity, Density, Neutron	Correlation, Porosity, Saturations, Hole Size, Resistive Anisotropy
Dipole Sonic	Sonic compressional and shear	Porosity, Mechanical Properties,
Formation Images	Formation Micro-Imager borehole images	Structure, Env. Deposition, Fractures
Magnetic Resonance	Magnetic Resonance	Porosity, free and bound fluids, Permeability
Elemental Spectroscopy	Elemental Capture Spectroscopy	Lithology
Natural Gamma Ray Spectroscopy	Spectral GR	Clay Minerals
MDT Tool	Modular formation dynamics tester	<i>In situ</i> Fracture Pressure Fluid Samples
Sidewall Cores	Sidewall Coring Tool	Porosity, Permeability
Temperature Survey	Temperature Log	Geothermal Gradient Baseline for Fluid Migration
VSP	Vertical Seismic Profile	Tie in to 2D regional profile Or be used for future monitoring techniques (if applicable)
CBL/VDL, CCL	Cement Bond Log, Variable Density Log, Casing Collar Locator	Casing cement integrity

3.3 CORE PROGRAM

3.4 FORMATION FLUID SAMPLES

[REDACTED]

3.5 FORMATION TESTING

[REDACTED]

3.6 DEMONSTRATION OF WELL MECHANICAL INTEGRITY

[REDACTED]

Table 9. Mechanical Integrity Tests

Class VI Rule Citation	Rule Description	Test Description	Program Period
40 CFR 146.89(a)(1)	MIT – Internal	Pressure test using liquid or gas to determine that there is no significant leak in the casing, tubing or packer	After construction
40 CFR 146.87(a)(4)	MIT – External	Pressure test using liquid or gas and a casing inspection log to demonstrate the internal and external mechanical integrity of the well	
40 CFR 146.87(a)(4)	MIT – External		
40 CFR 146.87(e)(1)	Testing prior to operating	Pressure fall-off test, pump test and injectivity test to verify the hydrogeologic characteristics of the injection zone	Prior to operation

The following wireline logs will be run (Table 10).

Table 10. Wireline Logging

Test	Description
Casing Inspection Log (Internal MIT)	To detect deformation, physical wear and or corrosion
Cement Bond Log (External MIT)	To evaluate integrity of cement job between the casing and the formation
Tracer Survey (Oxygen Activation Log)	To detect the movement of fluid behind pipe
Temperature or Noise Log (External MIT)	To detect thermal anomalies that deviate from the baseline gradient

[REDACTED]

[REDACTED]

1. [REDACTED]

2. [REDACTED]

[REDACTED]